Aalto University
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URBAN RENEWAL AND RESIDENTIAL DISPLACEMENT IN MYLLYPURO

Master's Thesis
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Abstract

I conduct a descriptive analysis on the socioeconomic change and potential displacement effect in a Finnish neighbourhood, Myllypuro, which is located in Eastern Helsinki.

Myllypuro is a typical Finnish suburb built in the 1960s with ample space and emphasis on multi-storey residential buildings. Since its initial construction, there has been little infill development or other change, until in the early 21st century several large, transformative construction projects for a new shopping mall, sports center, health station and a campus for university of applied sciences took place. The changes in both physical appearance and in reputation have been significant.

Urban renewal and gentrification are typically associated with a concern for the outcomes of most vulnerable incumbent residents. Significant increases in housing prices may force low-income residents out of their apartments. This descriptive analysis studies the share of movers who move out of the zip code and into a lower income neighborhood as a proxy for push migration or displacement.

To further validate the results, the analysis is conducted using two different control groups. Another subway neighbourhood in Eastern Helsinki, Kontula, is used as the first control group. The two neighbourhoods have very similar history, but over the years their trajectories diverge, as the improvements in Myllypuro take place. In second specification rental residents in non-subsidized housing are compared to those in subsidized housing within Myllypuro post code, as the incentives for the two groups vary significantly. This difference in incentives is a result of cost-based pricing implemented in subsidized housing.

Two main insights can be drawn from this thesis. First, the urban renewal and infill development appear to have influenced the alarming development seen in Myllypuro, where the share of higher income residents kept decreasing and the share of low-income residents climbed. Particularly higher-income in-migration has increased due to the new residential buildings. Second, despite an increase in neighbourhood attractiveness and housing values there is little evidence of low-income residents being displaced during the observation period in either of the two specifications.

However, as the analysis is purely descriptive, there is no presumption of causal inference. These results, even if they coincide with construction of the new mall and infill development around it, could be driven by some completely unrelated factors. The goal of this thesis is rather to provide a description of a neighbourhood in change and a starting point for further econometric analysis.

Keywords neighbourhood change, urban renewal, infill development, displacement

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Tiivistelmä

Tutkielmassani suoritan kuvailevan analyysin Itä-Helsingissä sijaitsevan Myllypuron naapuruston sosioekonomisesta muutoksesta sekä pienituloisten mahdollisesta korvautumisesta.

Myllypuro on tyypillinen suomalainen 1960-luvulla rakennettu lähiö, jossa rakentaminen on ilmavaa ja kerrostalovaltaista. Alkuperäisen rakentamisen jälkeen alueella on tapahtunut vain vähän täydennysrakentamista tai muita muutoksia, kunnes 2000-luvun alussa käynnistettiin useita suuria, muutosvoimaisia julkisia rakennusprojekteja kuten uusi ostoskeskus, urheilukeskus Liikuntamylly, terveysasema sekä ammattikorkeakoulun kampus. Muutokset sekä alueen olemuksessa että maineessa ovat olleet merkittäviä

Kaupunkiuudistukseen ja gentrifikaatioon liitetään usein huoli alueen kaikkein haavoittuvimmista asukkaista. Asumisen kustannusten kasvu saattaa pakottaa pienituloisia asukkaita muuttamaan asunnoistaan. Analyysissä käytetään pienituloisten syrjäytymistä esittävänä muuttujana sitä osuutta postialueelta pois muuttavia, jotka muuttavat aiempaa pienituloisemmalle postialueelle.

Tulosten vahvistamiseksi analyysi on toteutettu kahta eri kontrolliryhmää käyttäen. Toinen metrolähiö Itä-Helsingissä, Kontula toimii ensimmäisenä vertailukohteena. Näillä kahdella naapurustolla on hyvin samanlaiset lähtökohdat tarkasteluajanjakson alussa, mutta vuosien ja Myllypurossa toimeenpantujen muutosten myötä alueiden kehityskaaret eroavat toisistaan merkittävästi. Toisessa osassa vapaiden vuokra-asuntojen asukkaita verrataan tuettujen vuokra-asuntojen asukkaisiin Myllypuron sisällä. Näiden ryhmin kannustimet eroavat toisistaan selvästi Helsingin tuetun asuntokannan erityispiirteiden vuoksi.

Tutkielmasta on löydettävissä kaksi pääasiallista oivallusta. Ensinnäkin Myllypurossa tapahtunut kaupunkiuudistus ja täydennysrakentaminen vaikuttaisi kääntäneen alueen huolestuttavan kehityskulun, jossa yli keskituloisten asukkaiden osuus laskee ja pienituloisten kasvaa. Erityisesti parempituloisten muuttajien osuus on kasvanut uusien asuinrakennusten myötä. Toinen lopputulema on se, että huolimatta naapuruston kasvaneesta vetovoimasta ja asuntojen hinnannoususta huolimatta näyttöä pienituloisten vuokralaisten syrjäyttämisvaikutuksesta ei löydy kumpaankaan kontrolliryhmään verratessa tarkasteluajanjaksolla.

Analyysin ollessa puhtaasti kuvaileva kausaalisuhdetta ilmiöiden välillä ei voi olettaa. Tämän tutkielman päämäärä onkin kuvata naapurustossa tapahtunutta muutosta sekä tarjota aloituskohta tarkemmalle ekonometriselle analyysille.

Avainsanat naapurustomuutos, kaupunkiuudistus, täydennysrakentaminen, pienituloisten korvautuminen

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1 Introduction

The city of Helsinki is growing at a fast speed. Its population is expected to grow by 22-36 percent by 2050, and this growth may induce some negative externalites, such as inadequate supply of housing and rapidly increasing housing costs. To accommodate growth while keeping prices from escalating Helsinki utilizes extensively infill development, which can be defined as building on vacant lots in already populated areas. Infill development is typically considered as an environmentally and economically convenient way to increase the housing stock. Benefits and downsides are however hotly debated. Evaluating and understanding the actual outcomes of such measures is crucial in order to implement a well-rounded housing policy that accomplishes its goals.

A common concern related to infill development and urban renewal is the displacement of most vulnerable residents. This could happen if new, higher-quality housing stock and increased neighbourhood appeal attract wealthier new residents. These new residents may induce positive spillover effects such as improved services which ultimately contribute to an increase in housing prices. If the cost of living significantly increases, the least affluent rental residents might be forced to relocate into a more affordable location or apartment. This issue is further emphasized as lower-income areas tend to see most infill development. In Finland, the low-income suburbs are often those built in 1960's and 1970's. They are often quite depreciated, but the resident density is small so it is possible to increase both housing stock and neighbourhood quality through infill development. These neighbourhoods may also be more attractive to developers. As McConnell and Wiley (2010) note, the biggest obstacle to infill development is typically residential opposition. In the depreciated suburbs there is perhaps smaller share of owners who are actively resisting this kind of community change.

Literature mainly report slightly positive or insignificant changes to housing values around new infill development (see e.g. Ooi and Le (2013) and Kurvinen and Vihola (2016)) and in areas targeted with urban renewal programs (see e.g. Ahlfeldt et al. (2017) and Rossi-Hansberg et al. (2010)), Evidence on significant displacement effect that is induced by

gentrification, urban renewal or infill development is scarce (Freeman (2005)). This potential contradiction might result from rents that adjust slowly to increased housing prices. Also the increased housing supply could reduce rents (Pennington (2021), Asquith et al. (2021)).

This thesis is focused on the neighbourhood change and potential displacement effect in a Finnish suburb. For the past decade Myllypuro, once a notorious and depreciating neighbourhood in eastern Helsinki has undergone a significant increase in reputation and overall neighbourhood attractiveness, something other similar suburbs have been unable to achieve. Myllypuro has been a target of many urban revitalisation programs, as well as public projects like construction of a new mall and a health station. Significant amount of infill development was constructed within a relatively short period of time. In this thesis migration trends that contribute to the cycle of improvement Myllypuro appears to be experiencing are investigated to produce a detailed explanation on the main drivers of this change. Particular emphasis is placed on the lower income residents by assessing whether the substantial increases in housing prices (Kallio (2019)) and overall reputation (Nieminen (2020)) could have led to displacement.

Empirical part consists of two specifications. First, Myllypuro is compared to an adjacent neighbourhood, which has experienced similar development until the drastic renewal actions in Myllypuro took place. Then, rental residents in subsidised and non-subsidised housing within Myllypuro are compared to investigate potential displacement effect.

Results seem to confirm that the notions of McKinnish et al. (2010) and Brummet and Reed (2019), who claim that the neighbourhoods are changed in most part by inmoving residents, hold for Myllypuro as well. Affluent inmovers since 2012 seem to be the largest direct cause shifting Myllypuro into a new trajectory. New infill development has increased the number of inmovers, who have been on average more affluent than the incumbent residents, shaping the overall income diversity of the neighbourhood. Higher income residents, higher quality buildings and public development projects have induced

positive externalities, supposedly improving the attractiveness of the area as whole.

As for the second part of the analysis, there is little evidence of displacement or push migration in Myllypuro. Displacement was proxied as the share of outmovers who move into post codes with lower income level. Rental residents in non-subsidised apartments were compared to those in subsidised, cost-based rental apartments. There is no discernible increase in outmoves to lower income post codes for residents in non-subsidised apartments. Low-income residents in Myllypuro also were not more likely to suddenly move out of Myllypuro when compared to another similar neighbourhood in Helsinki. Despite a significant increase in housing prices, there is thus little reason to believe that low-income residents of Myllypuro are being displaced, at least within the bounds of the observation period employed. It could also be, that the encumbent residents appreciate the increased neighbourhood quality over the increase in price. The observed socioeconomic change might then be mostly driven by so-called indirect displacement, caused by selective entry. In other words, the rate of low-income outmovers does not increase, but the new inmovers are systematically wealthier than before. Additionally, the turnover rate of high-income residents may decrease, contributing to the increase in mean disposable income.

There are several potential pitfalls connected to empirical urban research. Spatial data is by its nature non-random, which makes causal inference difficult or even impossible. The goal of this thesis is not to suggest causal inference, but rather to visualize the data in order to describe a neighbourhood in change and explore the possibility of adverse effects.

2 Previous literature

The literature on the effects of urban renewal and infill development is quite varied. In most studies the effect on housing prices is slightly positive (see for example Ooi and Le (2013), Rossi-Hansberg et al. (2010), Zahirovich-Herbert and Gibler (2014) and Ahlfeldt et al. (2017)). Research on the effects on rents is scarcer, but recent studies papers by Pennington (2021) and Asquith et al. (2021) show that rents decrease in the vicinity of new construction. Neighbourhoods however differ in many aspects, making straightforward conclusions impossible. Construction of housing, and particularly social housing, may have very different effects in affluent and in poor neighbourhoods. According to Diamond and McQuade (2019), accommodation of lower income-residents through subsidised housing may decrease property values in affluent neighbourhoods, while in poor areas new construction can increase overall neighbourhood quality and thereby housing prices.

This literature review is broken into three sections. First, neighbourhood change and gentrification are described, along with the mechanisms behind these phenomena. Then a review of quasi-experimental research papers on the effects of infill development and urban revitalisation is conducted. Research on subsidised housing concludes the chapter.

2.1 Migration trends, gentrification and displacement

Areas may be differentiated using the concept of economic gains. A neighbourhood experiences economic gains if it experiences an increase in the average income level. Considering a simple supply and demand framework, it is natural to assume that housing prices and income level might be cointegrated, as the wealthiest can outbid lower-income households for the most desirable places to live. As Rosenthal (2008) observes, there is often constant fluctuation in the form of economic gains and losses within neighbourhoods. These patterns are in part driven by the aging and depreciation of the housing stock and redevelopment, but social interactions associated with local externalities are likely to make significant contributions to them too. Having more affuent residents in an area can produce positive externalities, such as increased homeownership share, more amenities, and

perhaps even better schools and services. A gentrification refers to neighbourhoods that are originally low-income but have experienced significant economic gains. The exact definition varies, sometimes incorporating qualities such as education level or the quality of local services.

Ellen and O'Regan (2011) take a comprehensive look into the change in low-income neighbourhoods. They find no significant displacement of the poor in economically gaining neighbourhoods. Satisfaction and incomes of the original residents even increased when compared to other low-income neighbourhoods. Racial stability was higher in the gaining areas, as they were better able to avoid the loss of white households. Ellen and O'Regan (2011) investigate the common belief that original residents might be harmed in the process of intensive community development. It is important to note, that even though prices may increase, so do usually the amenities and attractiveness of the neighbourhood. This is further demonstrated by the fact that even though price levels increased, people who did not experience income rises in gaining neighbourhood remained. It can thereby be assumed that they felt the quality of the neighbourhood to have increased as well. Higher-income residents appear to move rather exclusively to economically gaining low-income neighbourhoods but not into non-gaining. Ellen and O'Regan (2011) divide sources of the neighbourhood income change into three categories. For economically gaining neighbourhoods at least one of the following has to hold:

1. selective entry: new entrants have higher income than in the neighbourhood on average.

2. selective exit: households exiting have lower incomes than on average on the area.

3. incumbent upgrading: stayers gain increase in income.

Changes seem to be mostly driven by homeowners. In gaining neighbourhoods in-moving homeowners had higher while out-moving homeowners had lower incomes than in the neighbourhood on average. Both inmoving and outmoving rental residents were mostly of similar economic means as in the area on average. Most of the new infill development appears to take place in gaining neighbourhoods. To increase the overall neighbourhood

quality, just building more is not enough. New construction should also be of higher quality than in the area on average.

McKinnish et al. (2010) study the gentrification of low-income neighbourhoods. They use confidential micro-level data from 1990 and 2010 to study the demographic process in neighbourhoods that gentrified during the 1990's. Somewhat opposed to common belief that gentrification is bad news for the poor and minorities, they find that gentrification appears to provide attractive neighbourhoods especially for middle-class black households. Standard filtering model predicts that the original low-income residents might be displaced as willingness-to-pay for residency by more affluent households increases. Gentrification can generate new amenities and perhaps the loss of original residents who value these amenities can be avoided to some extent.

The potential displacement effect makes gentrification a hot-button issue, but literature offers little confirmation to the fear of higher income residents replacing less affluent and minorities in economically gaining neighbourhoods. Freeman (2005) investigate the issue in United States. He develops selection criteria to separate gentrifying and non-gentrifying neighbourhoods. Between 1980 and 2000 find that in gentrifying neighbourhoods' prices and the level of educational development increased and the poverty rates decreased more rapidly in gentrifying neighbourhoods. He compares the mobility and displacement in gentrifying and non-gentrifying neighbourhood to find out the effects of gentrification on pre-existing residents. There are differences, but they are rather small: probability of being displaced is 0.9% in non-gentrifying and 1.5% in gentrifying neighbourhoods.

2.2 Urban renewal and infill development

Infill can be defined as development that occurs in underutilised parcels in already developed, urbanized areas (McConnell and Wiley (2010)). Measuring infill is difficult for several reasons. The definition above implies, that the surrounding area must be developed, but there is no unequivocal way to define whether an area is developed or not. Infill can be measured as the amount of new buildings, or it can also include redeveloped properties.

Infill development is justified often by its sustainability (reducing environmental effects of transportation for example), capability to induce savings in infrastructure, and revitalize distressed neighbourhoods by attracting more upper- and middle-income residents as well as new amenities. McConnell and Wiley (2010) also present the most important empirical findings and outcomes from the literature, along with a detailed list of possible obstacles to infill development. These include economical infeasibility for developers, status quo bias, opposition of residents, and risk aversion of homeowners. Developers may find the process unprofitable if there is significant struggle in the process of obtaining land or difficulties induced by highly restrictive zoning. Residents may view underdeveloped parts of their neighbourhood as valued and important part of the environment they care about, leading to status quo bias. Resident opposition is seen as the most significant obstacle to infill development. It is worth noting that according to the literature, the risk of decreased housing values close to infill development is small. However, housing is the biggest asset most people own so if there is some supposition that the infill development may hurt the housing or land value nearby, exhibition of extreme risk-aversity on behalf of the owners of this surrounding property can be expected.

Price changes from infill development happen through two channels; amenity and supply. The former assumes a gap in the quality between new and old housing, and the additional construction either increases or decreases the overall quality and price level. Supply channel conversely contributes to a decrease in housing prices, brough on by additional supply of apartments. Models typically focus on two types of externalities: neighbourhood effects due to shared amenities and neighbourhood characteristics, and spillover effects due to adjacency with immediate neighbouring properties (Ooi and Le (2013)). These externalities affect the capitalisation of the neighbourhood factor into housing. Thereby benefits and costs can be rather safely assumed to be incorporated in housing prices. Increases or decreases in the price of housing stock may be considered as a sign of changed neighbourhood quality.

Autor et al. (2014) investigate the capitalization of housing externalities in the residential

housing values. They use the rent control elimination in Cambridge, Massachusetts in 1995. Until that, the rent increases were controlled by implementing strict caps. Additionally, removal of units from rental stock was restricted. The goal of these housing policies was to provide affordable housing. The controlled rental units were rented at prices 40 per cent below those of non-regulated rental apartments. The average maintenance level of controlled apartments was significantly lower as well. The end of rent control was implemented quickly, and it was to a great extent unanticipated, offering an interesting environment for a quasi-experimental study. They expect the decontrol efforts to directly increase the value of landowners' property, while indirectly affecting the desirability of surrounding properties. These indirect effects can be rationalized by considering for example owners, who have more incentive to maintain and renovate their newly uncontrolled property, drawing more affluent residents, leading to an increase in income level. This indirect channel has effect on both controlled and uncontrolled properties, unlike the direct channel. This assumption is justified. Sims (2007), who studies the same Cambridge decontrol efforts, notes that chronic maintenance problems are more prevalent in controlled units, compared to non-controlled ones. The decontrol induced many effects, among them high tenant turnover. Autor et al. (2014) estimate that the value of controlled apartments increased by 18-25 percent relative to never-controlled apartments following the decontrol. Prices seemed to increase in proximity of controlled units after decontrol as well, implying that the removal of rent control increased overall neighbourhood quality. In the 75th percentile of rent control unit exposure, economic gains were 13 percent more than at the 25th percentile of exposure. Even though the amount of private investment increased, the total value of Cambridge residential investments between 1995 and 2004 were only one quarter of the overall estimated increase of housing values caused by the rent control removal. Thus, they conclude that the allocation channel appears to be much more significant than the investment channel. The economic effects were significant. When estimated with conservative numbers between 1994 and 2004, decontrol added almost exactly 2 billion dollars to the housing stock value in Cambridge. Of this 84% was credited to indirect effects. The average increase in residential unit value was 16 percent during the same period. They state that the residential spillovers are large

and that when considering public housing policies, they should be considered not only through direct, but also through indirect effects.

Ooi and Le (2013) study infill development in Singapore employing arbitrarily chosen rings around the new development and estimating the price changes of surrounding properties before and after the new developments. This change is then compared to price changes of properties of a comparable control group. They argue that infill development tends to be sold at excessive prices and calculate the price premiums developers earn to be around 4,8%. In addition to two most studied channels, amenity and supply, they also include a third channel concerning capitalisation of new information, following the effects all the way from purchase of the land until the point where apartments are turned over to their new owners. They find that capitalisation effect is concentrated in the land acquisition and preparation phase when the housing prices in immediate vicinity of new infill construction site increased up to 2,11%. The effects are heterogeneous regarding the attributes of developments such as location, height, and scale. The relative physical size of new buildings has a negative impact on these prices, while building on teardown sites has positive externalities.

Rossi-Hansberg et al. (2010) study the housing externalities that are caused by revitalisation programs in Virginia, United States. They focused on the Neighbourhoods-in-Bloom program, which directed federally funded housing investments to a few struggling neighbourhoods. In their paper government intervention, such as subsidised renewal projects, are justified by assumption that market interactions between households and houses within a neighbourhood that the residents cannot control lead to inefficiency in equilibrium allocation of housing. They provide a model of housing externalities, where the value of housing services to agents (homeowners in this case) depends linearly on the value of their own house, and a weighted average of the value of all surrounding houses, both measured net of land rents. Weights decrease exponentially with distance. They use changes in land prices to measure the magnitude of revitalisation policy effects. In their model the agents maximize a Cobb-Douglas utility function through consumption of goods and housing services.

Their estimates obtained by using a semiparametric hedonic price regression imply that the neighbourhoods targeted with residential urban revitalisation projects experienced on average 2-5% increase in land prices annually compared to control neighbourhoods. They observe that these results are unlikely to be caused by increased private investments, since anyone moving there after the Neighbourhoods-in-Bloom program probably would have taken advantage of the program. Second reason they offer is that the level of overall sales in project neighbourhoods did not change after the implementation of programme. Additionally, externalities appear to decrease by half approximately every 1000 feet. The return on each dollar spent on the program caused the land value to increase by 2 to 6 dollars. Even though these results do not necessarily fully extend to other cities and countries, their paper does show the existence of significant housing externalities.

Ahlfeldt et al. (2017) conduct a quasi-experiment in Berlin, studying spatially targeted renewal policies that followed unification of the city in 1990. They find that these policies increased renovation and maintenance spending and reduced the propensity of poor-quality buildings, accompanied by property price increase of 0.1-2% per year. This increase however seems to mostly follow from the change in internal quality upgrades, implying the absence of significant externalities or spillovers. They state that it is unclear whether the spatially targeted renewal policies induce improvements in welfare even though they appear to have a beneficial effect on the built environment.

Zahirovich-Herbert and Gibler (2014) find price effects to be insignificant in size as well. They estimate the impact of new single-family construction on the surrounding housing prices employing a hedonic pricing model. Their results imply positive but very small effects for the average size homes. The effect was slightly bigger for relatively larger houses.

Pennington (2021) utilizes the variation in probability of new development caused by serious building fires in San Francisco. A fire increases the likelihood of new development, but the location and timing of such events are random. She concludes that while new residential buildings may contribute to the gentrification of the area in the long run, it

also decreases rents by 1.2-2.3 percent for residents within 500 meters of the new building. Additionally, the probability of displacement is reduced.

Asquith et al. (2021) find rents to decrease by 6 percent compared to units that are slightly farther away. Using address-level microdata on new construction in 11 cities they construct three empirical strategies and conduct difference-in-differences analysis comparing buildings by location and time, and finally combining the two for a triple-difference specification. They show that even though the housing stock is significantly increased and new buildings accommodate higher-income residents, there is little evidence of strong demand effect. This might follow from the certain attributes of the neighbourhoods, as typically new construction is aimed at areas that are already changing.

In Finland, there has been some research on the subject. Ahvenniemi et al. (2018) study seven case neighbourhoods in Helsinki metropolitan area (HMA) to investigate the impact of infill development on existing properties. Changes were captured by a difference-in-difference estimator, and value formation was estimated with a hedonic regression model. They find neither positive nor significantly negative effect. Differing results were obtained by Kurvinen and Vihola (2016), who also use a hedonic regression and a difference-in-difference approach to study the price effects in Helsinki metropolitan area. They find immediate positive effects of 2.3% to 2.6% on price levels of similar buildings within 300 meters of a newly completed multi-story apartment building.

Price changes in Myllypuro are examined by Kallio (2019), who finds that the value of pre-existing multistories in Myllypuro has seen an increase of cumulative growth of 4 to 16 percent above comparable control neighbourhoods in the past decade. He contributes this increase to urban revitalisation projects, and in particular the construction of new shopping mall.

2.3 Subsidised housing

Diamond and McQuade (2019) use Low Income Housing Tax Credit (LIHTC) development in the United States to estimate the spillover effects of subsidised infill development on surrounding property prices. Developers cannot control when the funding is granted or the exact geological location, and this non-randomness is exploited to identify the price effects. Through transforming data on housing prices to data on the derivative of housing prices with respect to distance from LIHTC development, they develop a nonparametric difference-in-differences style estimator to factor out local time trends and neighbourhood variation. Combined with a structural, generalized hedonic model of housing choice they can recover individual preferences. Long-term partial equilibrium welfare effects are measured so that there are zero moving costs, and when affordable housing is constructed, all households will reoptimize. Renters and homeowners face same optimization problem in the pre-period. For households who live far away from new LIHTC housing, the welfare effect is zero. For homeowners who live close to new sites, and choose to move away, the welfare impact is given by the change in prices. At least in the short term, renters benefit if the LIHTC is seen as an amenity. If LIHTC is seen as a disamenity, the rents should decrease. The welfare effects are calculated also for landlords whose properties are located near LIHTC sites. Aggregating all these, they get the overall welfare effects to the society. They find that income and race affect households' preferences for LIHTC proximity. Households in the bottom income quintile are willing to pay 6% of their house price to live within 0.1 mile from an LIHTC site. For the second quintile the price effects are essentially zero, but third and fourth quintile households in low-minority areas are willing to pay about 1.6 percent of their house price to avoid living 0.1 from an LIHTC site. In high-minority areas 3rd and 4th quintiles have economically insignificant effects. In low-minority, affluent neighbourhoods subsidised infill development appears to cause welfare loss, while the opposite is true for lower income areas with higher share of minorities. Does this indicate that building subsidised housing in low-income areas is the most beneficial strategy? General equilibrium effects are not considered, so it is difficult to know whether these results provide sufficient understanding of the subject. It may also be worthwhile to consider whether the overall benefit maximization should be the goal,

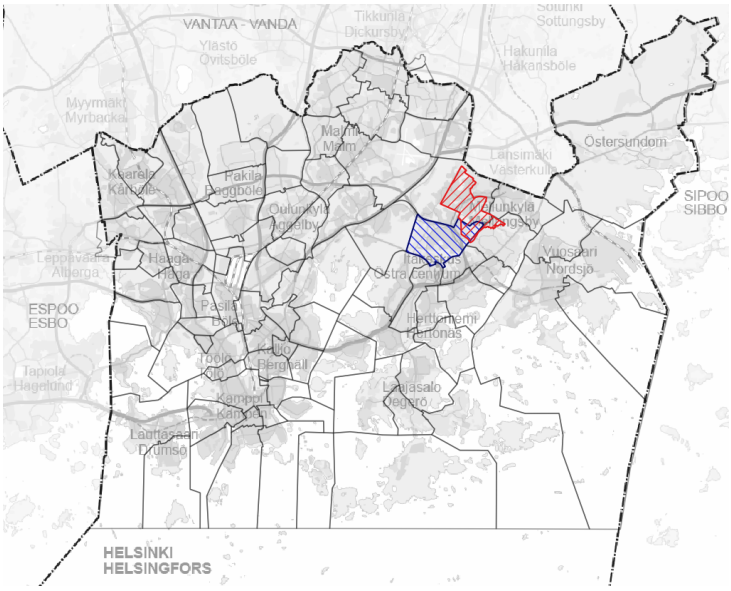
or if the distribution of additional welfare should play a part. Particular concern is shown over the outcomes of the most vulnerable in high-poverty areas.

Chetty et al. (2016) study the effects of the Moving to Opportunity program in United States, which provided randomly chosen families from high-poverty housing projects vouchers to move to neighbourhoods less affected by poverty. They report substantial benefits to children who moved to lower-poverty neighbourhoods below the age of 13, including higher level of education and a decreased probability of becoming a single parent. In their mid-twenties, these children had a 31% higher annual income on average relative to the control group. While acknowledging the significance of these results, Diamond and McQuade (2019) argue that the monetary benefits of building in higher-income areas would be offset by substantially larger opportunity cost of having one building less in the low-income neighbourhood.

3 Research design and data

In this thesis neighbourhood change is described using two specifications. In the "neighbourhood specification" another neighbourhood, Kontula, which bares major resemblance to Myllypuro is used as a control group. The location of both neighbourhoods are displayed in figure 1. Second approach employed to examine this subject is to stay within the borders of Myllypuro and compare renters in subsidised (ARA) and non-subsidised housing ("ARA specification"). Using residents in the same area as a control group may seem unintuitive, as they experience all the same time- and neighbourhood fixed effects. An important difference between ARA and non-ARA rental housing is that ARA rents are cost-based and should thus be unaffected by changes in demand. If there is displacement induced by increasing rents, this effect should then be visible for non-ARA residents but not for ARA residents. The Finnish ARA system and the Helsinki housing company are introduced in more detail in Appendix B, along with a brief review of the Helsinki housing market.

Figure 1: Treatment and control neighbourhoods



Notes: This map of Helsinki shows the treatment neighbourhood Myllypuro in blue and the control neighbourhood Kontula in red.

In both specifications at least 20 years old residents of multistorey apartment buildings are considered. The outcomes of interest are the evolution of mean disposable income and characteristics of movers into and out of the neighbourhood. For the neighbourhood specification, income structure of residents is examined and the mechanism behind neighbourhood change is discussed in detail with emphasis on the role of infill development and inmovers. ARA specification focuses on the displacement effect, which is proxied by the share of low-income movers who move out of Myllypuro and into one with a lower mean disposable income than Myllypuro.

3.1 Neighbourhood characteristics and descriptive statistics

Myllypuro is a typical Finnish suburb in eastern Helsinki built in 1960s with ample space and plenty of multistorey apartments. Like many other similar neighbourhoods, there has been little renewal after it was first built, and it has depreciated over time in both physical condition and reputation. This deterioration had become apparent at the turn of the century. Services were declining, and the old mall was outdated and disreputable. According to Nieminen (2020), the already poor reputation of Myllypuro may have further suffered by an incident in 1998, when soil in an area built on an old landfill was found to be contaminated. This caused a potential health hazard for the residents who were evacuated and eventually all 11 multistorey buildings in the area were dismantled.

Since 1997, Myllypuro has been target of several urban revitalisation projects, including EU-funded Urban I and Urban II. These projects focused on improving the reputation of notorious suburbs by increasing general neighbourhood attractiveness. The neighbourhood change in Myllypuro began to pick up speed with completion of several public construction projects over two decades. These include new sports complex Liikuntamylly which was opened in 2000, construction of a new health station (finished in 2012), campus for the University of applied sciences Metropolia (first part finished in 2019) and the reconstruction of the central city block. Renewed city block consists of a new shopping mall and residential housing around and above it. Construction lasted from 2009 to 2012. This time period is also the treatment period of this study, since that is when the most

Table 1: Summary statistics of Myllypuro

	Pre-existing buildings				Infill around new mall		
	Owners	Renters	ARA renters	Total	Owners	Renters	Total
Age	56	46	50	52	56	40	52
Male	0.42	0.49	0.45	0.45	0.45	0.50	0.45
Native language Finnish	0.85	0.73	0.75	0.78	0.82	0.61	0.77
Age over 65	0.36	0.15	0.23	0.26	0.35	0.08	0.30
Unemployed	0.04	0.14	0.14	0.09	0.03	0.11	0.05
Student	0.02	0.05	0.04	0.03	0.01	0.06	0.03
Highly educated	0.09	0.05	0.03	0.06	0.20	0.07	0.13
Mean disposable income	22,449	17,237	17,754	19,736	29,381	22,426	25,383
Income above median	0.53	0.27	0.24	0.37	0.69	0.41	0.55
Income in lowest quartile	0.16	0.43	0.41	0.31	0.08	0.28	0.15
Family size	2.46	2.75	2.93	2.68	2.54	2.68	2.51
Number of children	0.56	0.93	1.17	0.84	0.56	0.80	0.57
Apartment size (sqm)	66	57	62	62	82	57	67
Number of observations	48,084	28,167	37,203	133,363	2,641	2,034	7,418

Notes: This table summarizes the characteristics of at least 20 year old Myllypuro residents who live in multistorey buildings. Pre-existing buildings refers to older housing stock, while infill around new mall consists of ten multistorey buildings build on and around the new shopping mall. Mean disposable income is measured in euros and the group renters refers to non-subsidised rental residents. Table includes all observations from 1997 to 2018, and mean disposable income is adjusted for inflation.

intense changes took place. As the change has been gradual, three points in time are included in graphs of results section. The plans for new mall were accepted in 2004, construction of the central block (mall and infill development) began in 2009 and was finished in 2012. Ooi and Le (2013) note, that the capitalisation effect around new infill development was concentrated in the land acquisition and preparation phase. The power of expectations could be visible in Myllypuro too even before the actual construction period.

Major driver behind at least the quantifiable results is the influx of new residents to buildings around the mall. These buildings increased the housing stock in Myllypuro by more than 500 new apartments. Table 1 confirms that residents in new buildings greatly

differ from incumbent residents. They have a much higher disposable income than in pre-existing buildings: 25,383 euros to 19,736. They are also less likely to be unemployed or belong to the lowest income quartile. Share of highly educated is more twice as much. New apartments are also larger. Owners in new buildings have on average 82 square meters, but only 66 in older buildings. This radical difference in the socioeconomic composition of residents is an essential element in the mechanism that could possibly lead to displacement of low-income residents. Construction of housing that is of higher quality than the buildings around it tends to attract a larger share of more affluent residents. Increased neighbourhood attractiveness in the form of good quality housing and the purchasing power of higher-income residents could translate into increased services and increase in affluent people who are willing to move into the area. These improvements are captured by the value of housing, inducing increases in prices. Eventually, these price increases are translated into increases in rent as well, which might force low-income households out of their apartments.

For majority of the observation period, Kontula appears to evolve in a highly similar way as Myllypuro. Built in the same decade and similarly depreciated, they also have adjacent subway stations and are located side by side. Both have been part of same urban revitalisation projects since the 1990s, and there has been little infill development in either one after the initial construction (see figures A1 and A2 of the appendix). While Myllypuro has been a target of several influential construction projects for the past decade, hope of such improvements have remained out of reach for the residents of Kontula.

Tables 1 and 2 illustrate the characteristics of both areas. Comparing the population of Kontula to Myllypuro residents who live in pre-existing buildings, we notice many similarities. In both areas, 45 percent of population is men and 78 percent speak Finnish as native tongue, unemployment rate is 9% and the share of students is 3 percent. In Myllypuro 6% and in Kontula 4 percent of residents are highly educated. Mean disposable income is slightly higher in Kontula, 19,852 euros to 19,736 euros in Myllypuro. Share of residents in top two quartiles and in bottom one are 37% and 31% in Myllypuro,

Table 2: Summary statistics of Kontula

	Owners	Non-ARA renters	ARA renters	Total
Age	57.73	44.37	46.60	50.95
Male	0.44	0.48	0.44	0.45
Native language Finnish	0.88	0.71	0.72	0.78
Age over 65	0.39	0.14	0.15	0.25
Unemployed	0.04	0.14	0.13	0.09
Student	0.02	0.06	0.04	0.03
Highly educated	0.06	0.04	0.03	0.04
Mean disposable income	21,570	18,185	18,440	19,852
Income above median	0.47	0.31	0.26	0.36
Income in lowest quartile	0.17	0.39	0.38	0.29
Family size	2.55	2.83	2.88	2.73
Number of children	0.65	1.00	1.12	0.90
Apartment size (sqm)	69	57	63	64
Number of observations	89,462	39,351	79,597	225,242

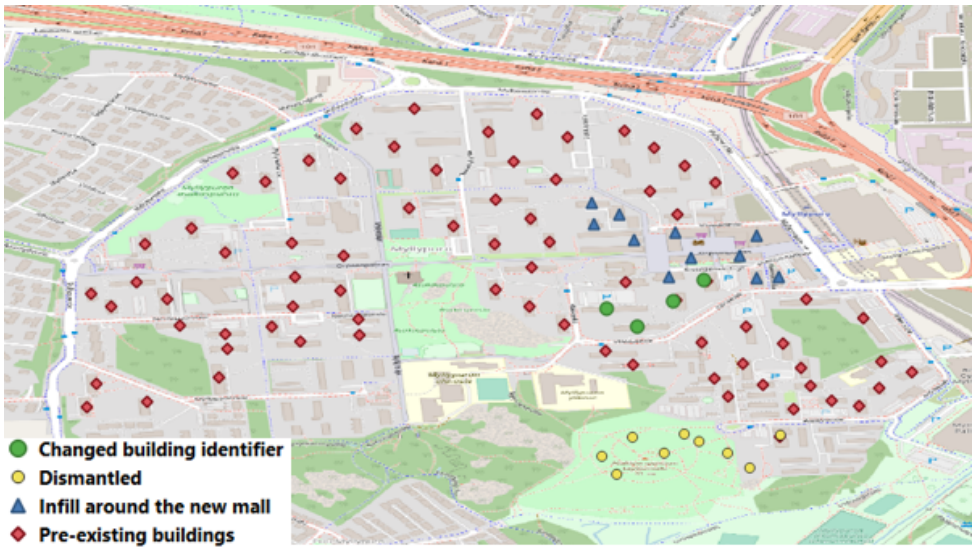
Notes: This table summarizes the characteristics of at least 20 year old Kontula residents who live in multistorey buildings. Mean disposable income is measured in euros. Table includes all observations from 1997 to 2018, and mean disposable income is adjusted for inflation.

and 36% and 29% in Kontula. These statistics are also presented separately by group to characterize owners, non-subsidised renters and ARA renters. It is worth noticing here that subsidised renters not only have slightly larger apartments than non-subsidised, but they also have higher mean disposable income. In Myllypuro, this difference is 517 euros and in Kontula it is 255 euros. Additionally, in both neighborhoods there are more observations for subsidised than non-subsidised renters, due to prevalence of subsidised housing.

3.2 Data

This thesis employs a dataset that is a combination of data on individual and building characteristics, exact geographic locations, and information on subsidised housing. Individual and building characteristics come from Statistics Finland's confidential Folk database which includes variables for the most important socioeconomic characteristics, collected annually at the end of the year. Exact geographic locations for multistorey residents allows matching of individuals to specific buildings. Additionally, information on subsidised housing allows for identification of residents living in subsidised apartments.

Figure 2: Multistories in Myllypuro

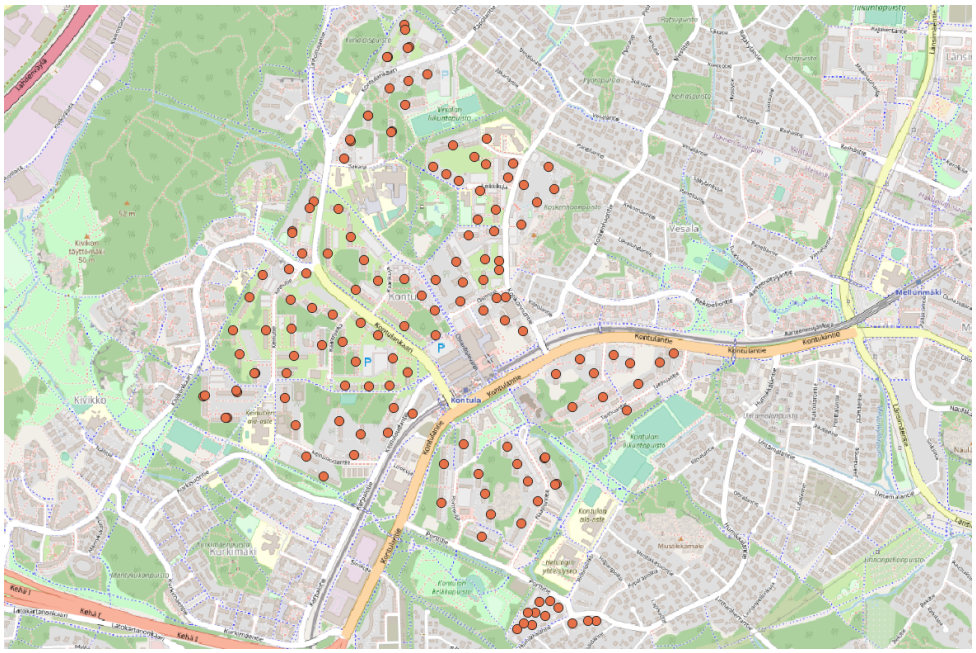


Notes: This figure displays the buildings in Myllypuro that are included in analysis. Infill development around the new mall is in blue. Dismantled buildings built on toxic landfill are displayed in yellow and the buildings where the building identifier was changed are displayed in green.

To create indicators for moves in and out of the neighbourhoods, all residents who lived in Myllypuro postal code at any time between 1995 to 2019 are identified. Then a panel dataset of their locations, socioeconomic characteristics and moves for each year is constructed. A similar panel dataset is constructed for Kontula. Kontula is part of the post code 00940, which entails also suburbs Kivikko, Kurkimäki and Vesala. These three suburbs are excluded from the analysis, as they differ from Kontula and Mellunmäki in age, reputation, size and other important dimensions. In Myllypuro only multistories within

1 kilometer from the mall are considered, and the eleven multistories built on the toxic landfill that were dismantled between 1999 and 2004 are excluded from the analysis of moving rates. Additionally, the building number of four buildings changes in 2005, so the movers of these buildings for this year are excluded as well.

Figure 3: Residential multistory buildings in Kontula



Notes: This figure displays the buildings in Kontula that are included in the analysis.

Mean disposable income for households is calculated using the OECD equivalence scale. A value of 1 is assigned to the head of the household, 0.7 to each additional adult and kids who are at least 14 years old and 0.5 to each child under 14. Total income is then divided by these weights. All adult residents in Helsinki are divided into income quartiles using this measure. All postal codes with a lower mean disposable income than Myllypuro are identified for each year. Employing these variables on the relative income level of individuals and post codes, it is possible to identify low-income residents who move to even lower income areas, which may be considered as a proxy for displacement.

4 Results

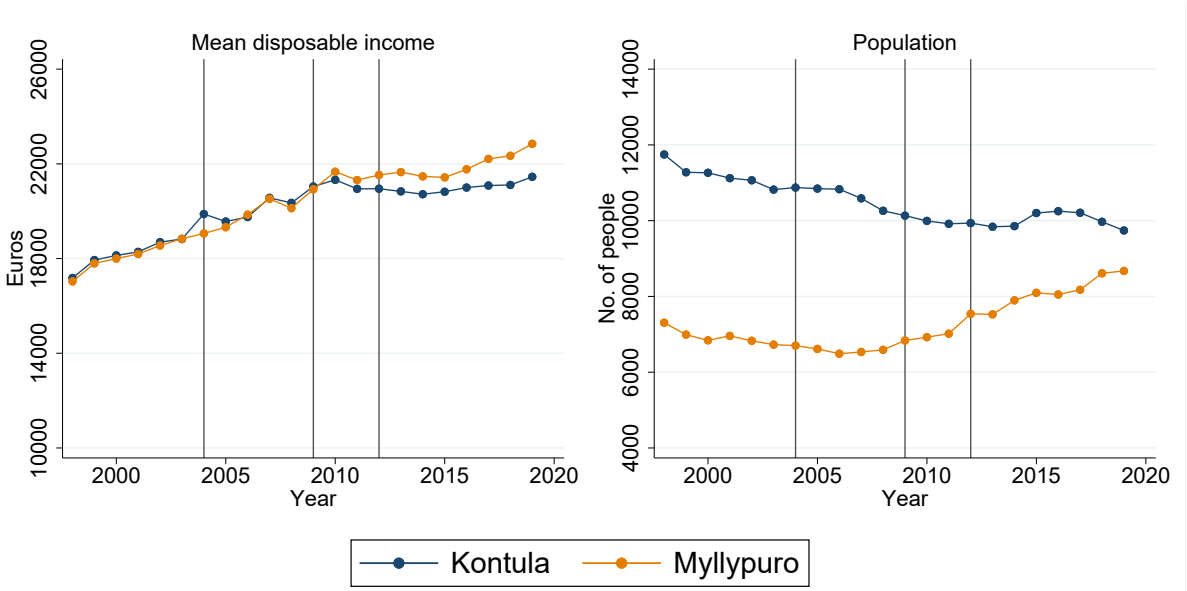
This section contains the descriptive analysis on the neighbourhood change and potential displacement. The first section covers the neighbourhood specification, aiming to understand the mechanism behind the socioeconomic change in Myllypuro. Second section is focused on the displacement effect, which is investigated in the ARA specification. Particularly in the second part, the numbers of observations are rather low and vary by year. Complete tables of the numbers of observations are included in appendix as tables A1 and A2.

4.1 Neighbourhood specification

Figure 4 depicts mean disposable income and population in both neighbourhoods. Mean disposable incomes develop almost identically until in 2010 they begin to diverge. This gap gradually increases, exceeding 6% in 2019. For the past decade income growth in Kontula has decreased, while Myllypuro has been able to avoid such development. The impact of infill development is clear in the right side of figure 4. Since year 2009 the population of Myllypuro has increased as a direct consequence of increased housing stock, but in Kontula opposite evolution has taken place. However, only multistorey residents are included in these results, so this description unavoidably remains incomplete.

Differences in the mean disposable income mirror the shift in the shares of low-income and above median residents, displayed in figure 5. Again, they develop quite similarly until in Myllypuro the decrease of above median residents and increase of low-income residents suddenly stagnates, or is even reversed. In 1998 the share of residents in first income quartile is 1.6 percentage points higher and share in top two income quartiles is 3.1 percentage points lower in Myllypuro. The difference in low-income residents then diminishes close to zero, and this gap in the share of top two income quartiles goes from 2.5 to 1 percentage points by 2007. From 2008 the difference begins to grow, and in 2019 Myllypuro has 4.3 percentage points less residents in first income quartile than Kontula and the corresponding share of residents with above median income is 3.9 percentage

Figure 4: Mean disposable income and population



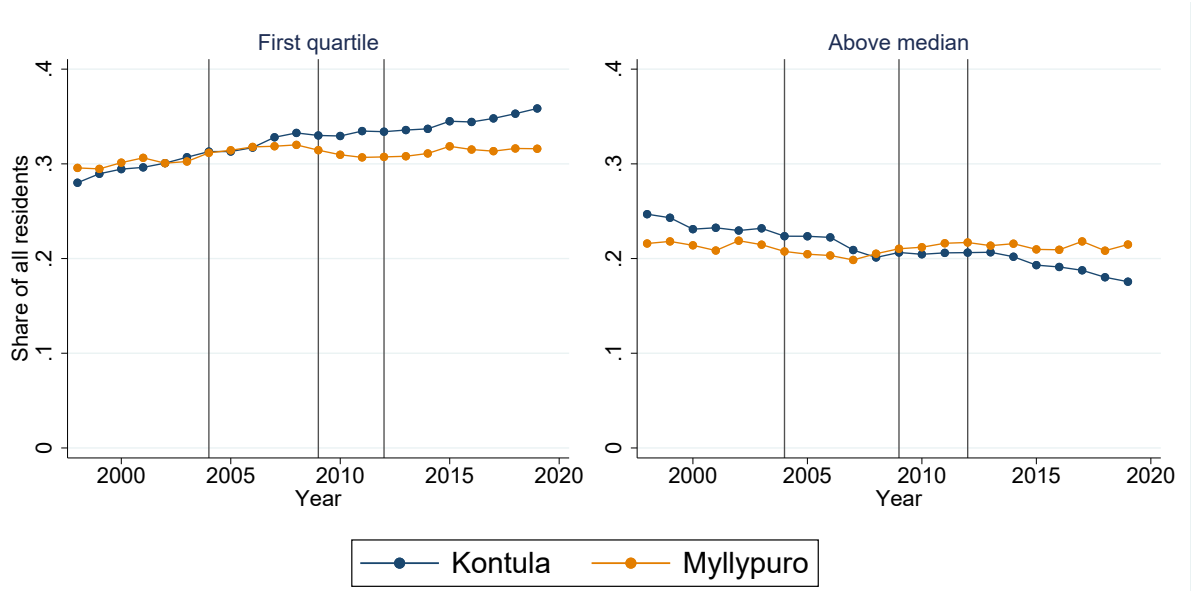
Notes: The first graph plots the mean disposable income for at least 20 year old multistorey residents in Myllypuro and Kontula. Population graph includes all residents who live in multistorey buildings. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

points higher.

To better understand the reason behind this diverge, the mean disposable income of in-movers is compared to that of outmovers in figure 6. Most of of the time mean disposable income of outmovers clearly exceeds that of inmovers, implying the gradual decline seen in the two neighbourhoods. In Myllypuro, as the construction of the mall begins and new housing is developed, the income of in-movers experiences a drastic jump, going from 16,165 euros in 2007 to 19,965 euros in 2010, an increase of more than 23 percent in just three years. This increase in mainly due to the relatively high-income residents in the new buildings around the mall. This number decreases again in 2013 and 2015, when there was no infill development finished, but begins to steadily increase from 2016 on.

Figure 6 is insufficient on its own to explain the causes of the diverging trajectories cap-

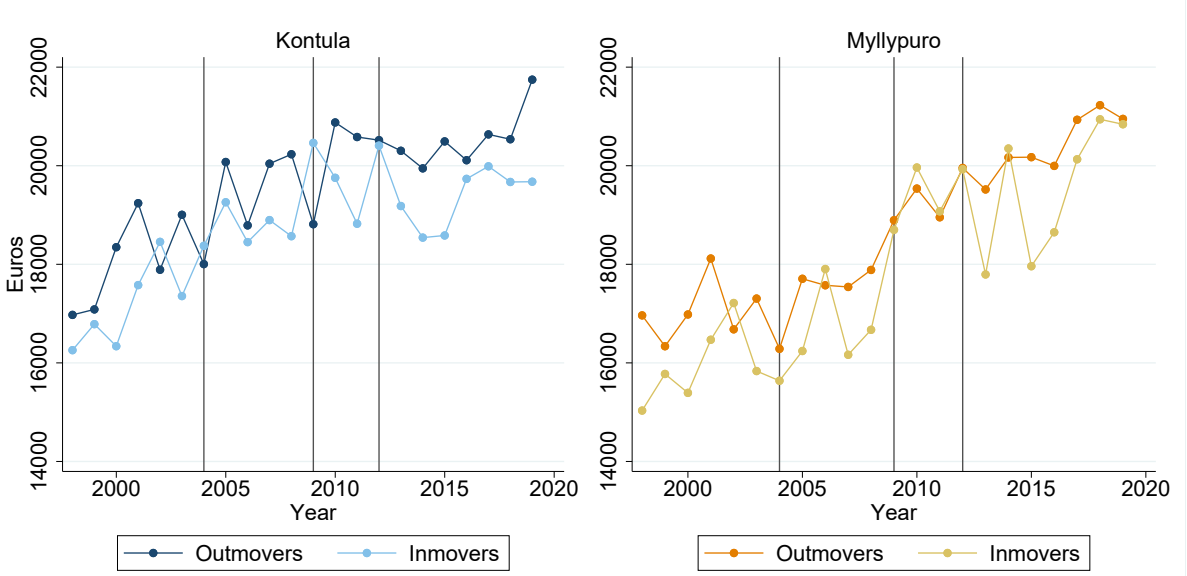
Figure 5: Share of residents in the lowest quartile and above median



Notes: This graph shows the shares of residents in the lowest and top two income quartiles in Myllypuro and Kontula. At least 20 year old multistorey residents are included. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

tured in figures 4 and 5. To complement it, figure 7 depicts overall migration trends. It displays movers into and out of the neighbourhood as shares of overall population. In-migration of residents in the first income quartile increases in both neighbourhoods, but more steeply in Myllypuro. This increase is particularly pronounced during the construction of the mall. According to table 1, in new buildings 28 percent of rental residents belong to the first income quartile, explaining most of this increase. Perhaps the most significant change is depicted by top-right graph. The amount of inmovers with an above median income increases significantly as a result of the infill development. For Kontula there is little change. Outmovers in both income groups seem to evolve similarly in both neighbourhoods. It is worth noticing, that in Kontula share of outmovers and inmovers are roughly equal, while in Myllypuro the number of inmovers far succeeds that of outmovers. Numbers for the share of outmovers are smaller and less varied even for Myllypuro. It seems that the changes are mostly induced by inmovers, supporting the notions of Brummet and Reed (2019) and McKinnish et al. (2010), who notice that in-

Figure 6: Mean disposable income of inmovers and outmovers

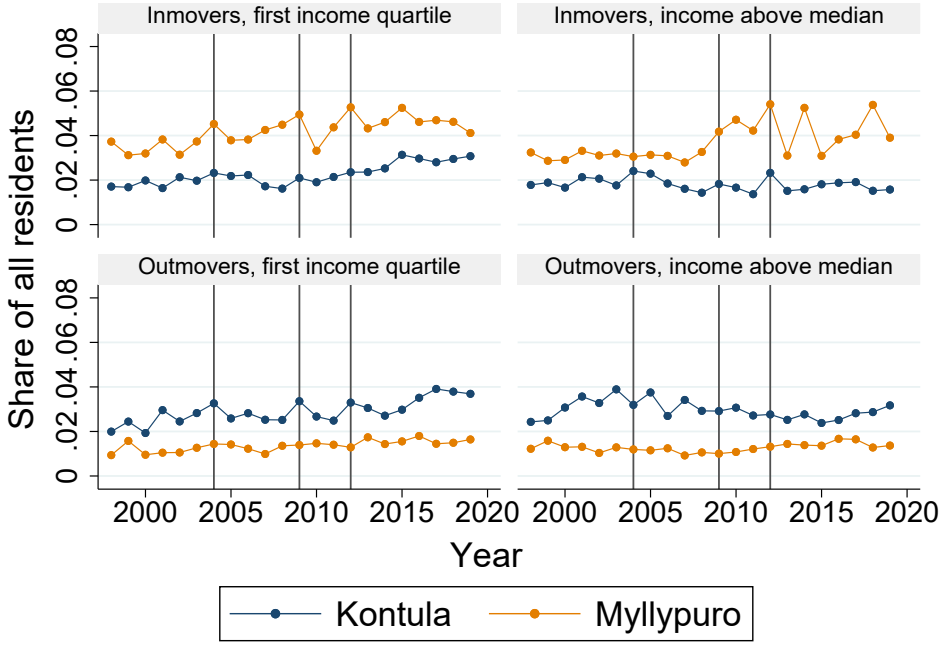


Notes: In these graphs outmovers is defined as residents who move out of the neighbourhood and inmovers is defined as residents who move into the neighbourhood. At least 20 year old multistorey residents are considered. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

migration of is more relevant driver of the neighbourhood change in economically gaining neighbourhoods than out-migration. A phenomenon where no direct displacement takes place, but the outmovers are gradually replaced by more affluent inmovers is called indirect or exclusionary displacement. If the low-income residents of Myllypuro were pushed out of their dwellings by increased housing costs, we should see a significant increase in the bottom left graph of figure 7. As there is little evidence of that, it seems likely that the neighbourhood change comes mostly from this indirect replacement of low-income residents with relatively higher-income inmovers.

If new residents indeed are the driving force behind these diverging trajectories, it is worth taking a closer look at them. Figure 8 displays the income groups as shares of all inmovers, giving perhaps a clearer view of the opposing evolutions. Before the construction of the new mall, more low-income and less above median residents were moving into Myllypuro

Figure 7: Migration trends

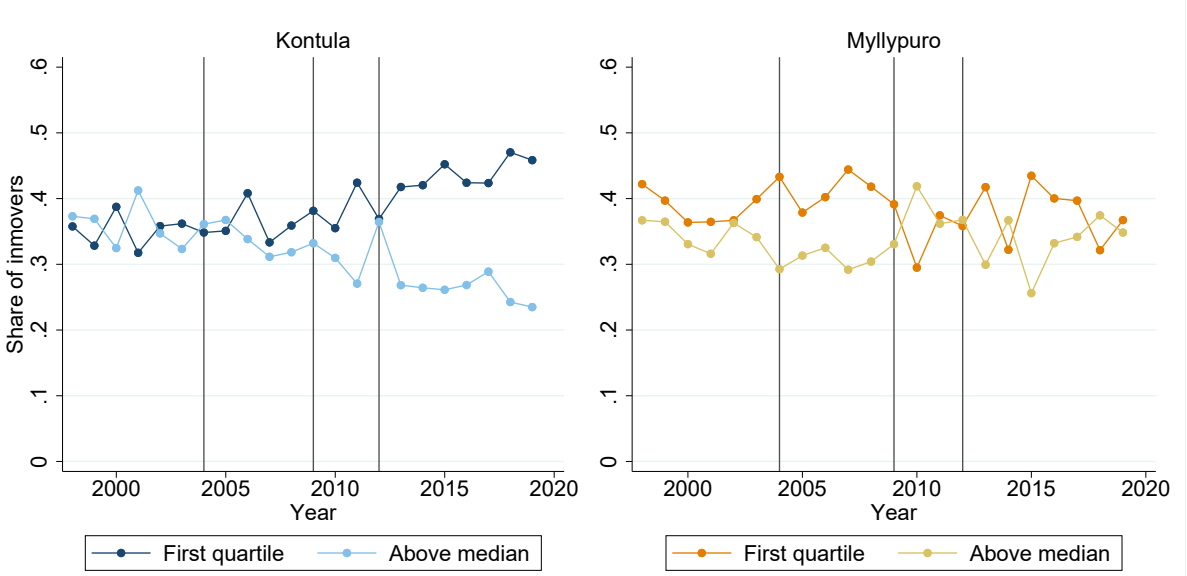


Notes: This figure plots inmovers and outmovers who belong either to the lowest or top two income quartiles. Inmovers is defined as residents who move into the neighbourhood and outmovers is defined as residents moving out of the neighbourhood. Numbers are calculated as a share of all residents in the neighbourhood that year. At least 20 year old multistorey residents are included. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

than to Kontula. Around 2010 this situation is reversed, and while Kontula is attracting an increasing amount of low-income residents, in Myllypuro the shares are much more alike. The effect of infill development can be seen as a peak in the share of above median inmovers in Kontula, when two multistorey buildings aimed at senior citizens were finished in 2012.

In summary, it appears that infill development has contributed to the socioeconomic upturn of Myllypuro greatly. It has increased the number of inmovers, and particularly the share of inmovers with an above median income. Figures 7 and 8 along with the right side of figure 4 together deliver an account on the diverging trajectories seen in Myllypuro and Kontula. Although infill development is but a part of a larger change in the area, the observed changes would have taken much longer to happen without the increase in

Figure 8: Inmovers by income group



Notes: This figure plots the inmovers in lowest or top two income quartiles as a share of all inmovers. At least 20 year old multistorey residents are included. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

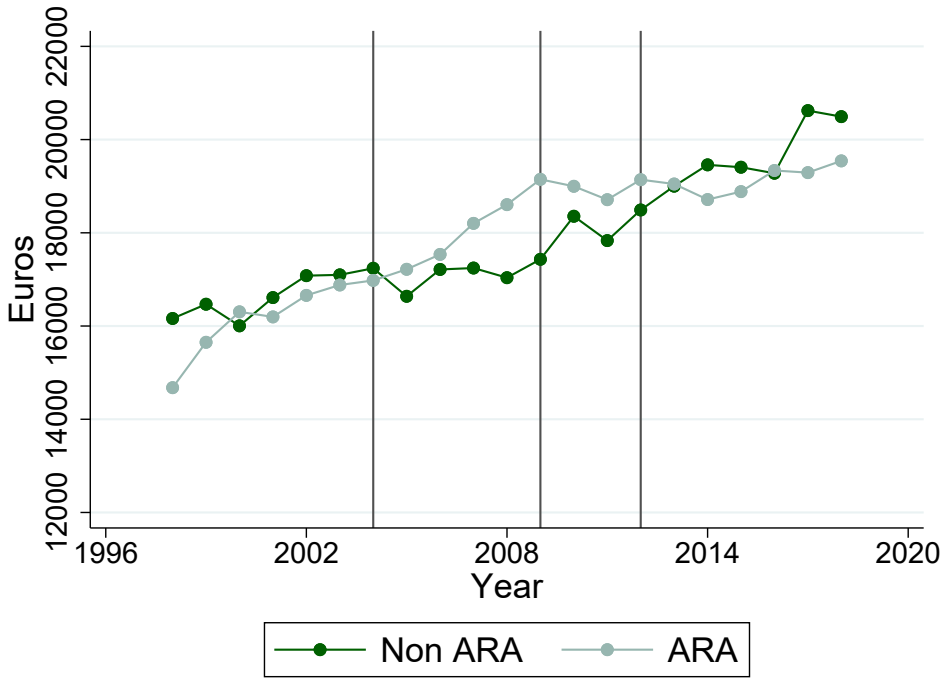
housing stock. It is impossible to know, whether this increase in higher-income residents and higher-quality buildings has brought on sustained positive externalities but the results seem encouraging.

4.2 ARA specification

Figure 9 shows the mean disposable income of rental residents in non-subsidised and subsidised dwellings. The mean disposable income of ARA residents increased quickly, and from 2005 to 2013 it was actually higher than that of non-subsidised residents. After the mall was completed in 2012, the increase in incomes of ARA residents ceased, while non-ARA residents' began to climb.

This curious development could be explained by lock-in effect. Residents in subsidised apartments with rents below market rate may find it profitable to stay in their apartments even though it might otherwise be beneficial (e.g., closer to work) for them to move into a market rate housing. In this case, forward-looking residents have an incentive to hold

Figure 9: Mean disposable income

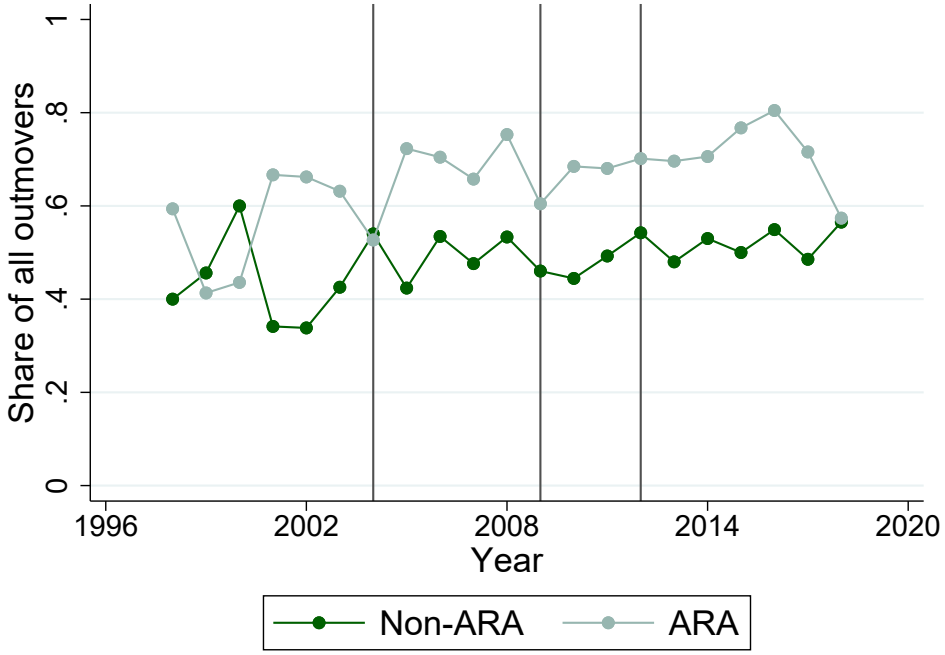


Notes: This figure shows the mean disposable income of at least 20 year old rental residents in Myllypuro multistories. Non-ARA refers to residents in non-subsidised, and ARA to residents in subsidised apartments. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

onto their subsidised apartment while waiting for the improvements in the neighbourhood take place. Should the price level increase a result of these changes, the relative benefit from the housing subsidy in form of an apartment would increase, making the lock-in effect even stronger. Expectations of a future increase in neighbourhood quality should also increase the attractiveness of these units.

Non-ARA rental residents had no such incentive to stay in the neighbourhood. The development period may have caused a drop in the perceived neighbourhood quality, as for several years the mall was replaced with a construction site and all its disadvantages. Additionally, an increase in neighbourhood quality in the future would likely increase their rents as well, making the option of persevering in the neighbourhood with lacking services even less tempting.

Figure 10: Share of outmovers who move into lower income postal code

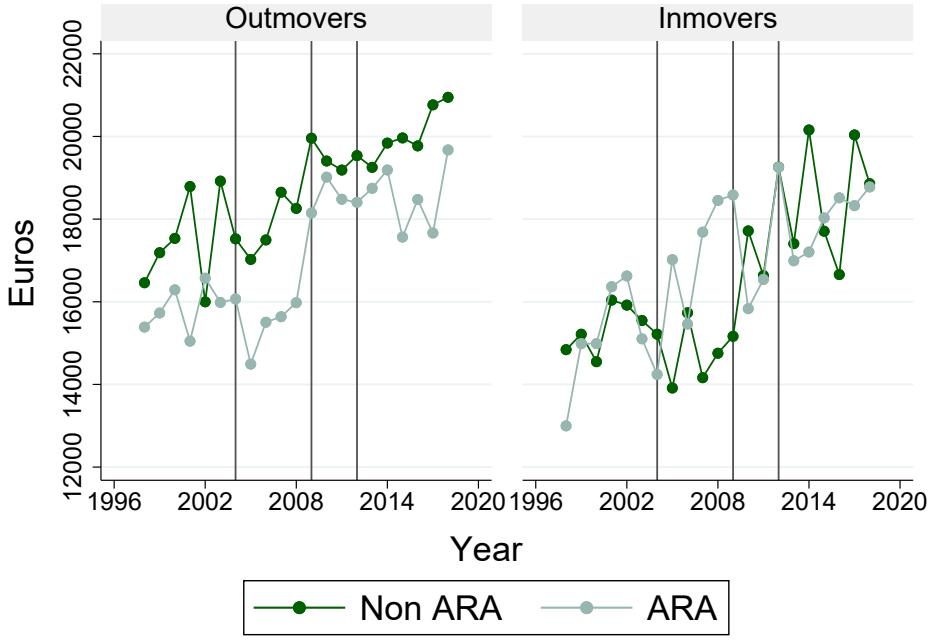


Notes: This figure shows outmovers who move into a lower-income neighbourhood as a share of all outmovers. At least 20 year old multistorey residents with an income below median and who move into another post code in Helsinki are included. Non-ARA refers to residents in non-subsidised, and ARA to residents in subsidised apartments.

Figure 10 displays the share of outmovers who move into a lower-income area in Helsinki. Only residents with income below median are included, as the aim is to proxy displacement effect. ARA residents are substantially more likely to move into lower-income post codes than other renters, and trends for subsidised and non-subsidised residents seem to move in opposite directions. For non-subsidised residents, there appears to be no increase in the share of moves to lower-income areas, giving little reason to believe in the existence of a notable displacement effect, supporting earlier observations.

Figure 11 compares the income levels of inmovers and outmovers of subsidised and non-subsidised renters. There is a significant increase for both outmover groups from 2005 to 2010. During the same time period, Myllypuro is able to attract far more affluent ARA

Figure 11: Mean disposable income of inmovers and outmovers



Notes: This figure compares the mean disposable income of at least 20 year old residents moving either into a Myllypuro multistorey or out of Myllypuro post code. Vertical lines refer to timing of "treatment" in Myllypuro. In 2004, the plans for new mall were accepted. The construction of the central block (mall and infill development) began in 2009 and was finished in 2012.

residents, but the opposite holds for non-subsidised renters. This all seems to sustain the assumption of the decrease in the neighbourhood quality during this time, which however has little effect on subsidised renters, as they are able to capitalize on the future improvements.

Overall, the analysis is in accordance with the supposition that residents in subsidised and non-subsidised housing tend to behave differently, even though they are quite similar in socioeconomic terms. There is little indication on the displacement of non-subsidised residents.

5 Conclusions

As Helsinki is emphasizing the importance of infill development and increased density to keep the city vibrant, enjoyable, and affordable while accommodating a large number of new residents, it is important to understand their effects as well as possible. This thesis contributes to this goal by investigating the effects of infill development and urban renewal on neighbourhood change and potential displacement in Myllypuro.

The descriptive analysis supports the main findings from the literature. New infill development has increased the number of relatively more affluent in-migrants, inducing positive externalities that affect the entire neighbourhood. Even though the housing prices and general neighbourhood quality have increased, displacement effect appears to be small or insignificant. However, Myllypuro is still going through this change and rents may adjust more slowly than apartment prices, making this thesis inconclusive in long term.

For the first 10 years of the observation period both Myllypuro and Kontula were experiencing a rapid structural change where the share of above median residents was decreasing and the share of low-income residents increasing. In Myllypuro this development was seized or even reversed, but Kontula has remained on the same trajectory. It seems likely that a large part of this difference can be contributed to the urban renewal process that has taken place in Myllypuro. In addition to tangible improvements, Myllypuro has been able to transform its reputation, from a notorious low-income suburb into a role model of urban renewal.

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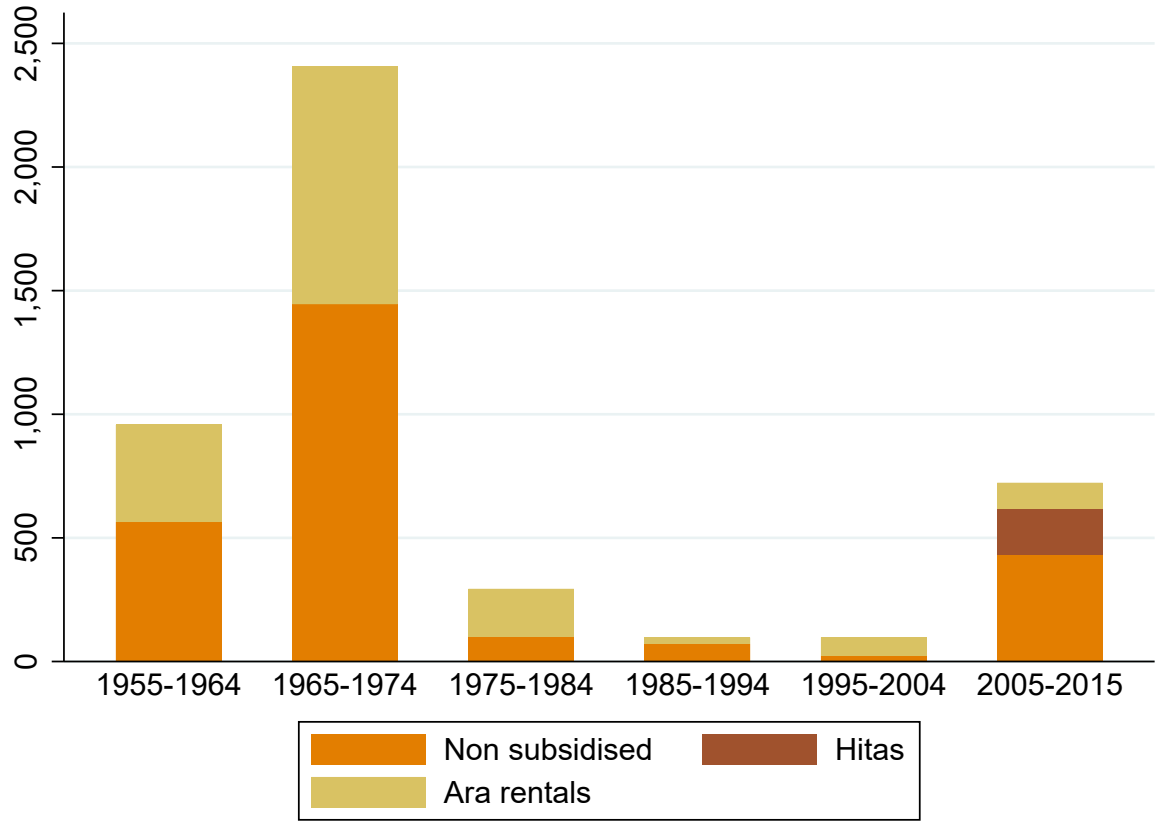
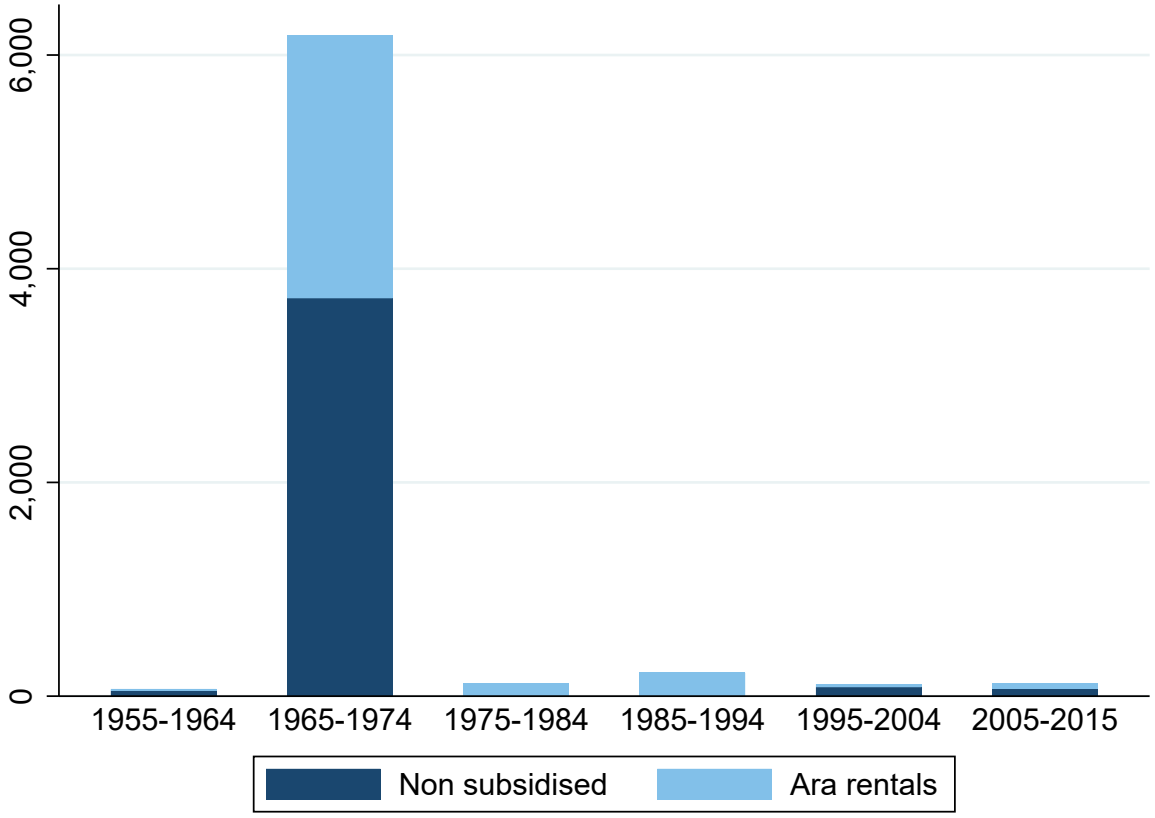
Appendix A Additional figures

Figure A1: Residential housing development in Myllypuro



Notes: This graph displays the number of new residential multistory apartments in Myllypuro. ARA rentals consists mainly of apartments owned by Helsinki housing company, but it also entails social housing targeted at specific groups such as students or the disabled. Hitas is a system to provide affordable owned apartments for the residents of Helsinki.

Figure A2: Residential housing development in Kontula



Notes: This graph displays the number of new residential multistory apartments in Kontula. ARA rentals consists mainly of apartments owned by Helsinki housing company, but it also entails social housing targeted at specific groups such as students or the disabled.

Table A1: Number of observations - Neighbourhood specification

	Myllypuro						Kontula					
	1st quartile			Above median			1st quartile			Above median		
Year	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out
1997	1,477	81	178	2,452	74	155	2,367	138	141	4,392	142	205
1998	1,631	97	227	2,317	126	196	2,444	123	164	4,215	150	180
1999	1,561	158	177	2,239	161	162	2,296	145	157	3,993	148	193
2000	1,579	95	178	2,112	130	143	2,406	113	198	3,881	180	165
2001	1,592	104	188	2,032	135	165	2,403	174	145	3,808	210	211
2002	1,496	104	174	2,056	101	172	2,362	142	209	3,745	190	209
2003	1,462	128	209	2,030	124	164	2,256	162	185	3,624	223	179
2004	1,535	140	245	1,918	117	160	2,299	187	226	3,541	183	236
2005	1,493	141	205	1,823	112	165	2,416	146	216	3,500	212	236
2006	1,508	124	205	1,791	120	158	2,481	158	219	3,436	151	188
2007	1,595	98	235	1,788	91	140	2,498	142	172	3,256	192	164
2008	1,594	136	248	1,768	103	156	2,487	142	153	3,121	165	141
2009	1,608	136	284	1,910	90	231	2,431	197	196	3,144	171	177
2010	1,616	146	192	2,015	103	270	2,472	161	179	3,121	185	161
2011	1,713	139	261	2,070	115	238	2,627	152	194	3,016	166	134
2012	1,776	130	337	2,230	121	340	2,638	216	221	3,050	181	229
2013	1,759	169	275	2,213	141	195	2,725	200	239	2,984	165	153
2014	1,783	140	307	2,288	128	342	2,700	186	251	2,965	190	147
2015	2,010	159	361	2,253	137	210	3,096	210	322	2,905	168	183
2016	1,845	188	309	2,258	173	213	3,046	246	308	2,991	176	200
2017	1,867	150	278	2,268	168	251	3,167	276	287	2,915	199	201
2018	1,974	149	305	2,251	121	260	3,288	284	305	2,771	215	158

Notes: This table summarizes the number of observations used to create graphs in the neighbourhood specification. Column title "in" refers to movers into and "out" refers to movers out of the neighbourhood.

Table A2: Number of observations - ARA specification

	Non ARA				ARA			
Year	Total	In	Out	Lower	Total	In	Out	Lower
1998	957	99	178	38	2,118	116	186	70
1999	1,209	135	191	50	1,829	192	123	76
2000	1,621	111	278	55	1,391	130	79	57
2001	982	117	201	37	1,955	115	131	73
2002	1,088	127	216	42	1,867	97	124	59
2003	1,126	122	266	28	1,863	136	122	80
2004	1,196	120	312	40	1,842	133	148	72
2005	1,182	126	235	44	1,545	122	115	74
2006	1,192	132	242	60	1,496	132	103	88
2007	1,540	99	258	37	1,217	100	80	67
2008	1,616	137	317	64	1,153	124	76	83
2009	1,662	122	280	50	1,161	116	126	64
2010	1,092	118	210	41	1,674	135	115	87
2011	1,141	121	246	42	1,586	128	127	80
2012	1,290	135	339	60	1,739	96	276	65
2013	1,107	194	304	74	1,949	152	143	102
2014	1,297	193	439	86	1,992	87	232	55
2015	1,378	192	354	77	2,072	119	245	82
2016	1,435	206	341	90	1,953	198	172	155
2017	1,481	246	328	92	1,936	114	159	80
2018	1,538	198	341	91	2,012	76	257	43

Notes: This table summarizes the number of observations used to create graphs in the ARA specification. Column title "in" refers to movers into, "out" refers to movers out of the neighbourhood and "lower" refers to outmovers who move into a lower-income neighbourhood than Myllypuro.

Appendix B Institutional framework

B.1 Helsinki housing market and city housing policy

Helsinki has stated its goal to become the most functional city in the world. Urban development and planning appear to be a subject of pride to the city. The population of Helsinki has increased rapidly, being 648,043 at the end of 2019 with projections for the 2050 population ranging from 884,000 to 795,000. Rapid population growth tends to pose some difficult challenges that must be dealt with one way or another.

Long-term city planning in Helsinki is conducted in accordance with the implementation programme on housing and related land use. This program is prepared every four years, for each council. I refer to the current program, approved on 11.11.2020 (City of Helsinki). The most important goals specified here include annual housing production target, which is 7000 housing units and at least 8000 units from 2023. This is a big improvement on the subject, since between 2003 and 2018, new construction amounted to around 3000 apartments per year on average. Environmental aspect is considered as Helsinki aims for carbon—neutrality by 2035. Housing costs are influenced through increased overall production as well as a construction quota of regulated housing units. Each goal has certain indicators, which are monitored annually. Suburban generation is defined as a tool to prevent regional segregation, with a purpose of improving the comfort and appeal of residential areas comprehensibly as well as enable high-quality infill construction. Current target areas for this regeneration are Malminkartano, Kannelmäki, Malmi and Mellunkylä. Additional objectives mention that homogenous residential areas should be avoided, and that the share of rental apartments in the housing stock of an area must not exceed 50% (City of Helsinki). Case for increased housing construction is justified. As Oikarinen et al. (2015) point out, housing supply in Helsinki is highly inelastic. This induces price increases and frictions for apartment seekers and may even limit the possibilities of growth and development. An important tool in accomplishing the city goals is infill development, which makes up 50 % of annual housing construction volume in Helsinki.

According to Vilkama et al. (2016), spatial aggregation of disadvantaged residents has increased, and socio-economically segregated areas have increased in size in Helsinki metropolitan area. Their research shows that increased immigration flows have been targeted very heavily to some areas, as immigrants tend to locate in areas with already relatively larger shares of immigrants. Additionally, these areas tend to often be socio-economically disadvantaged.

B.2 Housing finance and development centre of Finland

The first Finnish housing subsidy system, ARAVA was founded soon after the second world war in 1949 to provide solutions for the lack of housing supply. As disposition of sizable tracts of land to Russia was in completion, approximately 400 000 migrants from Karelia needed new housing within the newly shrunk borders of Finland. Going through a couple of changes in name and to some extent, the objective of their action, the institution now is known as the Housing finance and development centre of Finland or ARA.

ARA ownership is diversified, as it is shared by municipalities, non-profit organisations, and their subsidiaries. ARA employs steering and monitoring to make sure that the state subsidies are allocated correctly to residents. Municipalities monitor rents and resident selection, while ARA does the general steering of municipalities and debtors. Approximately third of the Finnish housing stock of 3 million apartments has been built with ARA state subsidies, with some 380 000 additional apartments renewed. In addition, ARA provides a body of information on the housing markets and produces their own research on the subject. The central aim is to provide safe and affordable housing conditions to its residents. Another longer-term goal is to promote diversity of the tenant structure.

B.3 Helsinki city housing company

Subsidised housing makes a big part of overall rental housing in Helsinki. Nearly half of all rentals (20% of overall housing stock) are part of ARA system. HEKA rents are approximately one third below market level rents, 13,29 euros per square meter on av-

erage. Average rent per square meter in non-subsidised apartments is 21,47 euros in the fourth quarter of the year 2020. It is impossible to make inference on the observable characteristics of individual subsidised and non-subsidised apartments, so this is not necessarily a valid comparison. ARA buildings are predominantly located in low-income neighbourhoods, and it is possible that they are systematically of lower quality, larger or lack amenities such as good access public transportation. Research however suggests, that after analysing the situation more closely via hedonic regression methods, there is a persistent and significant gap even after controlling for basic properties, such as distance from central business district, apartment size, age of apartment and general quality of dwellings (Eerola and Saarimaa (2018)).

Obtaining an apartment from HEKA is not a trivial task as there are many applicants and much fewer apartments become available annually. At the end of the November 2020, the numbers of applications waiting was 23,749 (54% of them very urgent, 29% urgent and 16% non-urgent) while the number of apartments supplied since January 2020 was 2,888. Even the applicants in most dire need face difficulties getting them. Problem is further exacerbated as the residents, after being lucky enough to be offered a HEKA home, may be reluctant to move out of their apartments, even if it no longer is the best fit for their needs. Rent increases in HEKA apartments are more restrained than in the non-subsidised housing market, which may contribute to a lock-in effect, where the relative benefit from living in subsidised apartment increases as the general price level around the subsidised building increases.

As the demand for these reasonably priced subsidised dwellings greatly exceeds supply, a large part of low-income applicants who are not offered a subsidised rental unit end up living in same low-income neighbourhood. Residents in subsidised units have higher incentives to hold onto their apartments, and they are unlikely to experience significant rent hikes or other conditions that might push them out of their apartment as other rental residents do. Thus in a way, the treatment effect that potentially causes displacement of low-income rental residents should not apply to subsidised rental residents.